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Dark energy and non-linear power spectrum

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We investigate the effects of homogeneous general dark energy on the non-linear matter perturbation in fully general relativistic context. The equation for the density contrast contains even at linear order new contributions which are non-zero for general dark energy. Taking into account the next-to-leading corrections, the total power spectrum with general dark energy deviates from the ΛCDM spectrum, which is nearly identical to that in the Einstein-de Sitter universe, as large as a few percent at scales comparable to that for the baryon acoustic oscillations and increases on smaller scales. The contribution from the curvature perturbation, which is absent in the Newtonian theory, exhibits even more drastic difference larger than 100%, while the amplitude is heavily suppressed on all scales.

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